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ABSTRACT

This paper presents an analysis and results of the Project TALENT questionnaire given in high-school, the 1-year follow-up questionnaire, and the 5-year follow-up questionnaire, as these dealt with anticipated or actual college majors. A series of tables are presented indicating the fields included in various categories of college majors; the percent of 12th grade sample choosing various college majors at various times; the multiple correlations with Talent tests and prediction of choice of and success in various college majors for those who went to college; an individual scale which shows the highest correlation for each criterion for males and females; and the similarity indices among predictors of various criteria for 12th grade males and females. The major points made from this research are: (1) the best way to predict what a high school student's college major will be is to ask him; (2) the best way to predict his success in that major is to give a conventional test of academic aptitude; and (3) one should use choice as a substitute criterion for success only as a last resort, for the correlates are likely to be different. (AF)

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WHO STUDIES WHAT MAJOR IN COLLEGE

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in Behavioral Science

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Who Studies What Major in College

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In the interest of human and social values, it is important to find ways of determining each person's potentials for a broad range of worthy achievements, and to learn which educational and social influences foster development of these potentials. It is also important to determine which potentials for valuable accomplishment go unrealized and undeveloped in order that appropriate corrective measures can be taken. The goals of Project TALENT are to provide information relevant to these problems. As the previous speakers have indicated, Project TALENT provides the first long range longitudinal study of a representative sample of students assessed with a comprehensive set of psychological, educational, and personal measures. Of the planned follow-up studies, the one-year and five-year studies have been completed.

One of the psychological hazards of long range longitudinal research for the researcher is that it takes an entire career for much of the data in which you are really interested to emerge. While there seems to be considerable questioning currently of whether science is long, there is little doubt that life is short, and I want to get on with answering the questions for which the data are in hand. In the current paper, therefore, I am going to consider choice of and success in various college majors. Choosing a major is an important decision for each college student, and reasonably complete data about this decision are available by five years beyond high school.

The original Project TALENT questionnaire given in high school, the one-year follow-up questionnaire, and the five-year follow-up questionnaire each included a multiple choice question about anticipated or actual college major. Unfortunately, the same alternatives were not used for all of these questions. Therefore, the responses to the one-year and five-year questions were reduced to the corresponding categories of the original questionnaire according to the scheme shown in Table 1. You can see that the correspondence is less than perfect. Also, there is one omission in Table 1. Category 8, which was "Business Administration" on

the original questionnaire, should also include "Business and Commerce" as a major on the five-year follow-up questionnaire. Students choosing "Business and Commerce" were included in this category in the data analysis.

For this paper, analyses were carried out for students who were in the 11th and 12th grades in 1960. When I began putting the tables together, however, various anomalies were found in the computer printout for 11th graders. Because of time limitations, I could not get the computer runs for this group repeated. Therefore, the tables present results only for 12th graders. In spite of the anomalies, the general pattern of results was similar for 11th graders.

Table 2 shows the unweighted percent of students choosing various majors at various points in time. The high school choice is given for those students who did not go to college and high school, one-year, and five-year choices for those students who did go to college.

The most important characteristic of those who did not go to college is the large proportion who did not expect to go. For males who went to college, the trends parallel trends reported previously for occupational choice. That is, there is a marked decrease in the proportion indicating engineering and the physical sciences as their major. It should be emphasized, however, that these results involve anticipated major in high school and actual major later on. Therefore, these results should indicate real changes, rather than just changes in aspirations. Trends for females are weaker and less clear cut.

The next step in the analysis was to correlate scores from the TALENT test battery with choice of and success in the various college majors. This analysis, and subsequent analyses, involved only those who went to college. Success was measured by student self reports of GPA in their major field. Considerable evidence has accumulated in other research that such self reported GPA's are highly correlated with GPA's obtained from college transcripts.

In some previous TALENT work, more than 100 test scores have been included in multiple correlations. Although other people may not find it a problem, I find the results of such an analysis too complex for me to make much sense of. Therefore, the present study analyzed 31 test scores, including 3 a priori composites of the TALENT ability tests -- Verbal Composite, Quantitative Composite, and Technical Composite --, the TALENT vocational interest test, the TALENT personality test, and a measure of socio-economic status. These measures have been described in detail in previous Project TALENT reports. The aptitude composites were chosen for similarity to commonly used aptitude composites and and for independence in the sense of having no tests in common.

Table 3 shows the multiple correlation between this test battery and choice of and success in the various college majors. Correlations with choices are multiple point biserials while correlations with GPA are multiple product moment correlations. Table 3 also shows multiple point biserials for recruitment to various fields on the five-year follow-up. A recruit was defined as a person who indicated he majored in a particular field on the five-year follow-up but had chosen a different field on the high school questionnaire. The correlations in Table 3 compare recruits to each field with students in general.

In interpreting these results, it must be remembered that there are ceiling effects on the point biserials resulting from the small proportion of students choosing any particular major. Where the proportion is very small, the ceiling effect may be severe. Therefore, it appears that for many majors choice of and success in that major can be predicted with approximately equal success from the test battery used in this study.

Much evidence has appeared in the literature recently suggesting that the best way to find out something about someone is to ask him. Therefore, Table 3 also shows the phi coefficients between choosing each major in high school and indicating the same major on the five-year follow-up. These phi's are most comparable to the multiple point biserials with 5-year follow-up choice. This comparison suggests that predicting from the test battery and predicting from the student's choice are roughly equivalent with respect to accuracy. It is much more efficient, of course, simply to ask the student, "What major do you expect to study?"

In a brief paper, it is very difficult to give you any idea of the overall flavor of the results. As one way of doing this, Table 4 and Table 5 show, for males and females respectively, the individual test score having the highest correlation with each criterion. My sweeping generalization for today is that the best predictor of choice of a given major is likely to be scores on a corresponding vocational interest scale and the best predictor of success in that major is likely to be scores on a conventional test of academic aptitude.

Perhaps the most important trend in these two tables, however, is that the predictors of choice and success are not the same. This is not a small point, for psychologists are often forced to use choice as a substitute criterion for a measure of success. Therefore, additional analyses were made of the similarity of the validities of all predictors against the various criteria. Results are shown in Table 6 and Table 7 for the M's and F's

respectively. The index of similarity used is the index of similarity between vectors of factor loadings developed by Tucker and others and cited by Harman. I justify its use in the present context on the basis that the vector of validities is the same as the vector of factor loadings that would be obtained if, with unity in the diagonal, one passed the first factor directly through the criterion. This index is like a correlation in that it ranges from -1 to +1. It differs from a correlation in that it has no known sampling distribution and in that values must be much higher to indicate a high degree of similarity. When using it in matching factors, Harman suggests that values below .9 are much too low to justify calling them the same factor.

There appears to be considerable similarity among the predictors of choice at various points in time. This suggests, for example, that the kind of people who choose engineering in high school are the same kind of people who have majored in engineering five years later. One should not interpret these results too strongly, however, for they involve overlap and part-whole relationships. If 95% of those indicating a major on the five-year follow-up are recruits, there will obviously be a very high degree of similarity between the predictors of recruitment to and 5-year follow-up choice of that major.

The most important trend in these two tables is the relatively low degree of similarity between the predictors of choice and the predictors of success. This suggests that choice is an inadequate substitute for a measure of success, and should be used as such a substitute only in desperation when no other possibility is available.

I have now come to the end of my paper, and can see no clear overall summary. Besides, I have already made my sweeping generalization for today. Therefore, I will conclude simply by listing what I consider to be the most important points emerging from this paper. These are:

1. The best way, in terms of efficiency as well as accuracy, to predict what a high school student's major will be is to ask him.

2. The best way to predict his success in that major is to give him a conventional test of academic aptitude.

3. One should use choice as a substitute criterion for success only as a last resort, for the correlates are likely to be different.

Table 1

Fields Included in Various Categories of College Major

	High School	1-Year Follow-up	5-Year Follow-up
1.	Biological Sciences	Biological Sciences	Biological Sciences
2.	Physical Sciences	Physical Sciences	Physical Sciences
3.	Engineering	Engineering	Engineering
4.	Mathematics	Mathematics	Mathematics
5.	Pre-medical	-------	Pre-medicine
6.	Pre-dental	-------	Pre-dentistry
7.	Pre-law	-------	Pre-law
8.	Business administration	Business and Commerce	Accounting
9.	Education	Education	Elementary Education Physical Education Education (other)
10.	Sociology or psychology	Psychology	Psychology Social Sciences (other)
11.	Political science or economics	Social Studies	Economics
12.	Foreign languages	Foreign languages	Foreign languages
13.	Other liberal arts	English and literature Philosophy	English History Humanities Philosophy
14.	Fine arts	Fine arts Music	Fine arts Music
15.	Agriculture	Agriculture and forestry	Agriculture or forestry
17.	Home economics	Home economics	Home economics
18.	Pre-theology	Religion	Religion or Theology
19.	Journalism	-------	-------
20.	A field not listed above	Some other	Architecture Library Science Other health professions Social work Some other
21.	Do not expect to attend college	-------	-------
22.	All others	All others	All others

Table 2

Per Cent of Project TALENT 12th Grade Sample Choosing Various College Majors at Different Times

	Males				Females			
	No College	College			No College	College		
	H.S. Choice	H.S. Choice	1-yr fu Choice	5-yr fu Choice	H.S. Choice	H.S. Choice	1-yr fu Choice	5-yr fu Choice
Biological Sciences	0.9	2.6	6.8	4.4	0.5	2.6	5.1	3.2
Physical Sciences	1.4	8.0	6.1	4.9	0.4	2.2	1.6	1.3
Engineering	9.0	23.1	15.7	12.6	0.0	0.3	0.2	0.1
Mathematics	1.5	4.2	5.2	4.1	0.4	3.0	3.2	2.7
Pre-medical	0.6	5.7	----	1.2	0.5	2.4	----	0.3
Pre-dental	0.4	2.1	----	0.5	0.2	0.5	----	0.2
Pre-law	0.9	4.3	----	0.8	0.2	0.8	----	0.0
Business Administration	5.7	13.4	15.8	18.0	10.1	10.2	8.3	6.7
Education	1.8	5.2	4.6	5.5	3.8	26.4	20.6	23.4
Sociology or Psychology	0.3	1.5	2.3	7.2	0.9	5.7	3.4	7.2
Political Science or Economics	0.2	1.3	7.0	2.7	0.1	0.7	5.6	0.3
Foreign languages	0.5	0.5	0.9	0.9	0.7	3.0	3.7	2.9
Other liberal arts	0.4	3.5	3.6	9.7	0.5	4.9	7.6	11.9
Fine arts	1.3	2.6	2.8	2.3	1.5	6.2	5.7	5.1
Agriculture	2.5	2.7	2.7	2.6	0.0	0.1	0.1	0.0
Nursing	0.2	0.1	----	0.0	9.2	8.9	----	4.2
Home economics	0.1	0.0	0.1	0.2	1.3	3.9	3.6	3.5
Pre-theology	0.2	1.6	1.0	0.6	0.1	0.2	0.7	0.3
Journalism	0.3	0.9	----	----	0.3	1.4	----	----
A field not listed	7.3	7.2	11.8	4.3	5.2	7.5	13.8	4.0
Do not expect to attend	46.4	3.8	----	----	51.6	4.8	----	----
No response	18.1	5.7	13.6	17.5	12.5	4.3	16.8	22.7

Table 3

Prediction of Choice of and Success in Various College Majors for Those Who Went to College

	Multiple Correlations With TALENT Tests										Phi's Between H.S. Choice and 5-yr Follow-up Choice	
	Males					Females						
	H.S. Choice	1-yr fu Choice	5-yr fu Choice	5-yr fu Recruit	GPA	H.S. Choice	1-yr fu Choice	5-yr fu Choice	5-yr fu Recruit	GPA	Males	Females
Biological Sciences	.20	.32	.24	.20	.47	.23	.28	.25	.20	.49	.18	.28
Physical Sciences	.31	.25	.24	.16	.42	.28	.20	.23	.15	.58	.30	.35
Engineering	.51	.44	.41	.18	.30	.15	.13	.11	.07	---	.42	.39
Mathematics	.25	.23	.23	.17	.42	.34	.33	.32	.19	.41	.27	.49
Pre-medical	.39	---	.16	.07	.69	.22	---	.11	.09	---	.26	.28
Pre-dental	.19	---	.10	.07	.96	.09	---	.06	.07	---	.22	.15
Pre-law	.28	---	.11	.08	.70	.14	---	.08	.06	---	.10	.17
Business Administration	.46	.35	.34	.17	.34	.41	.30	.25	.15	.45	.32	.30
Education	.29	.18	.21	.15	.39	.37	.24	.25	.11	.40	.21	.43
Sociology or Psychology	.15	.13	.22	.20	.39	.17	.12	.18	.16	.41	.13	.21
Political Science or Economics	.16	.27	.14	.14	.45	.14	.17	.10	.10	---	.05	.02
Foreign languages	.11	.13	.12	.11	.70	.16	.18	.16	.13	.43	.23	.36
Other Liberal Arts	.24	.26	.34	.28	.43	.24	.27	.32	.27	.42	.16	.21
Fine Arts	.30	.26	.26	.15	.46	.31	.27	.24	.13	.41	.41	.45
Agriculture	.30	.27	.27	.15	.39	.06	.07	.08	.08	---	.49	---
Nursing	.07	---	.05	.05	---	.38	---	.25	.10	.49	---	.49
Home economics	.06	.07	.06	.06	---	.16	.14	.14	.10	.48	---	.51
Pre-theology	.21	.15	.12	.08	.86	.07	.11	.08	.08	---	.17	.00
Journalism	.18	---	---	---	---	.16	---	---	---	---	---	---
A field not listed	.16	.10	.10	.10	.44	.12	.14	.10	.09	.47	.08	.10

Table 4

Individual Scale Having Highest Correlation With Each Criterion For Males

	H.S. Choice	1-yr fu Choice	5-yr fu Choice	GPA
Biological Sciences	Interest in Biol. Sci. and Med.	Interest in Biol. Sci. and Med.	Interest in Biol. Sci. and Med.	Verbal Composite
Physical Sciences	Interest in Phys. Sci., Eng., & Math.	Interest in Phys. Sci., Eng., & Math.	Technical Composite	Quantitative Composite
Engineering	Interest in Phys. Sci., Eng., & Math	Interest in Phys. Sci., Eng., & Math.	Interest in Phys. Sci., Eng., & Math.	Quantitative Composite
Mathematics	Interest in Computation	Quantitative Composite	Quantitative Composite	Quantitative Composite
Pre-medical	Interest in Biol. Sci. and Med.	----------	Interest in Biol. Sci. and Med.	Quantitative Composite
Pre-dental	Interest in Biol. Sci. and Med.	----------	Interest in Biol. Sci. and Med.	Quantitative Composite
Pre-law	Interest in Public Service	----------	Interest in Public Service	Quantitative Composite
Business Administration	Interest in Sales	Interest in Sales	Interest in Computation	Quantitative Composite
Education	Interest in Social Service	Interest in Social Service	Quantitative Composite (Neg)	Quantitative Composite
Sociology or Psychology	Literary-linguistic Interests	Literary-linguistic Interests	Literary-linguistic Interests	Quantitative Composite
Political Science or Economics	Interest in Public Service	Literary-linguistic Interests	Socio-economic Status	Literary-linguistic Interests
Foreign Languages	Literary-linguistic Interests	Literary-linguistic Interests	Literary-linguistic Interests	Literary-linguistic Interests
Other Liberal Arts	Literary-linguistic Interests	Literary-linguistic Interests	Literary-linguistic Interests	Verbal Composite
Fine Arts	Musical Interests	Musical Interests	Musical Interests	Verbal Composite
Agriculture	Interest in Farming	Interest in Farming	Interest in Farming	Mature Personality
Nursing	Quantitative Composite (Neg)	----------	----------	----------
Home Economics	----------	----------	----------	----------
Pre-theology	Interest in Social Service	Interest in Social Service	Interest in Social Service	Verbal Composite
Journalism	Literary-linguistic Interests	----------	----------	----------
A field not listed	Quantitative Composite (Neg.)	Interest in Phy. Sci., Eng., Math. (Neg.)	Interest in Social Service (Neg.)	Mature Personality

Table 5

Individual Scale Having Highest Correlation With Each Criterion For Females

	H.S. Choice	1-yr fu Choice	5-yr fu Choice	GPA
Biological Sciences	Interest in Biol. Sci. and Med.	Interest in Biol. Sci. and Med.	Interest in Biol. Sci. and Med.	Verbal Composite
Physical Sciences	Interest in Phy. Sci., Eng., & Math	Interest in Phy. Sci., Eng., & Math	Interest in Phy. Sci., Eng., & Math	Mature Personality
Engineering	Interest in Phy. Sci., Eng., & Math	Interest in Phy. Sci., Eng., & Math	Interest in Phy. Sci., Eng., & Math	Quantitative Composite
Mathematics	Quantitative Composite	Quantitative Composite	Quantitative Composite	Quantitative Composite
Pre-medical	Interest in Biol. Sci. and Med.	----------	Interest in Biol. Sci. and Med.	Verbal Composite
Pre-dental	Interest in Biol. Sci. and Med.	----------	Interest in Biol. Sci. and Med.	----------
Pre-law	Interest in Public Service	----------	----------	----------
Business Administration	Interest in Office Work	Interest in Office Work	Interest in Office Work	Mature Personality
Education	Interest in Social Service	Interest in Social Service	Interest in Social Service	Verbal Composite
Sociology or Psychology	Interest in Office Work (Neg.)	Interest in Office Work (Neg.)	Verbal Composite	Quantitative Composite
Political Science or Economics	Interest in Public Service	Interest in Public Service	Quantitative Composite	Literary-linguistic Interests
Foreign Languages	Verbal Composite	Verbal Composite	Verbal Composite	Verbal Composite
Other Liberal Arts	Literary-linguistic Interests	Literary-linguistic Interests	Verbal Composite	Verbal Composite
Fine Arts	Musical Interests	Musical Interests	Musical Interests	Quantitative Composite
Agriculture	----------	----------	----------	----------
Nursing	Interest in Biol. Sci. and Med.	----------	Interest in Biol. Sci. and Med.	Mature Personality
Home Economics	Literary-linguistic Interests (Neg.)	Literary-linguistic Interests (Neg.)	Interest in Skilled Trades	Mature Personality
Pre-theology	Interest in Computation (Neg.)	Interest in Social Service	Interest in Social Service	Literary-linguistic Interests
Journalism	Literary-linguistic Interests	----------	----------	----------
A field not listed	Interest in Social Service (Neg.)	Interest in Biol. Sci. and Med.	Interest in Biol. Sci. and Med.	Verbal Composite

Table 6

Similarity Indices Among Predictors of Various Criteria for 12th Grade Males

	H.S. Choice vs. 1-yr Fu	H.S. Choice vs. 5-yr Fu	H.S. Choice vs. Recruit	1-yr Fu vs. 5-yr Fu	1-yr Fu vs. Recruit	5-yr Fu vs. Recruit	H.S. Choice vs. GPA	1-yr Fu vs. GPA	5-yr Fu vs. GPA	Recruit vs. GPA
Biological Sciences	.84	.87	.79	.94	.92	.99	.40	.66	.72	.78
Physical Sciences	.98	.97	.88	.98	.92	.96	.63	.72	.70	.74
Engineering	.99	.98	.92	.99	.94	.95	.52	.53	.55	.32
Mathematics	.95	.89	.79	.94	.89	.96	.44	.57	.57	.54
Pre-medical	---	.94	.71	---	---	.89	.53	---	.68	.75
Pre-dental	---	.77	.64	---	---	.87	.51	---	.49	.27
Pre-law	---	.84	.78	---	---	.95	.08	---	-.09	.01
Business Admin.	.98	.94	.63	.96	.69	.84	-.14	-.18	-.06	.04
Education	.88	.73	.58	.94	.87	.97	-.49	-.67	-.59	-.59
Sociology, Psychology	.88	.80	.71	.89	.85	.99	.26	.50	.67	.73
Econ., Political Science	.94	.69	.60	.52	.42	.99	.69	.54	.66	.61
Foreign Languages	.93	.83	.73	.92	.87	.98	.58	.65	.59	.58
Other Liberal Arts	.93	.93	.90	.98	.97	.99	.58	.79	.79	.83
Fine Arts	.98	.96	.90	.97	.93	.97	.32	.31	.45	.38
Agriculture	.98	.96	.85	.98	.90	.95	-.34	-.42	-.36	-.33
Nursing	---	.27	.25	---	---	.99	-.04	---	-.08	-.08
Home Economics	-.01	.11	.09	-.11	-.14	.99	-.25	.21	-.54	-.54
Pre-theology	.91	.81	.73	.91	.86	.97	.49	.24	.25	.10
Journalism	---	---	---	---	---	---	---	---	---	---
Other	.42	.47	.36	-.06	-.15	.98	-.72	-.02	-.65	-.59

Table 7

Similarity Indices Among Predictors of Various Criteria for 12th Grade Females

	H.S. Choice vs. 1-yr Fu	H.S. Choice vs. 5-yr Fu	H.S. Choice vs. Recruit	1-yr Fu vs. 5-yr Fu	1-yr Fu vs. Recruit	5-yr Fu vs. Recruit	H.S. Choice vs. GPA	1-yr Fu vs. GPA	5-yr Fu vs. GPA	Recruit vs. GPA
Biological Science	.98	.95	.94	.96	.95	.99	.48	.50	.60	.63
Physical Science	.96	.98	.96	.98	.95	.98	.54	.48	.52	.46
Engineering	.94	.90	.54	.92	.61	.74	.44	.40	.47	.18
Mathematics	.99	.99	.96	.99	.97	.98	.36	.35	.36	.35
Pre-medical	---	.92	.78	---	---	.84	.56	---	.64	.55
Pre-dental	---	.25	.04	---	---	.73	-.19	---	.27	-.06
Pre-law	---	.37	-.01	---	---	.74	.23	---	.41	.25
Business Admin.	.99	.97	.89	.97	.91	.96	-.23	-.16	-.09	-.06
Education	.84	.82	.21	.84	.28	.67	.24	-.21	.05	.00
Sociology, Psychology	.91	.78	.67	.80	.71	.98	.63	.60	.88	.88
Econ., Political Science	.93	.49	.47	.50	.48	.99	.60	.56	-.03	-.04
Foreign Languages	.95	.93	.82	.97	.92	.96	.73	.80	.80	.77
Other Liberal Arts	.92	.94	.90	.96	.95	.99	.69	.83	.83	.86
Fine Arts	.99	.96	.88	.98	.92	.95	.10	.19	.27	.33
Agriculture	.40	.27	.26	.66	.65	.99	.14	.08	-.13	-.14
Nursing	---	.83	.68	---	---	.92	.05	---	.27	.40
Home Economics	.92	.89	.69	.83	.73	.86	-.22	-.44	-.04	-.15
Pre-theology	.60	.24	.27	.67	.66	.99	.07	-.29	-.11	-.07
Journalism	---	---	---	---	---	---	---	---	---	---
Other	-.07	-.63	-.78	.62	.41	.93	-.84	.20	.69	.77